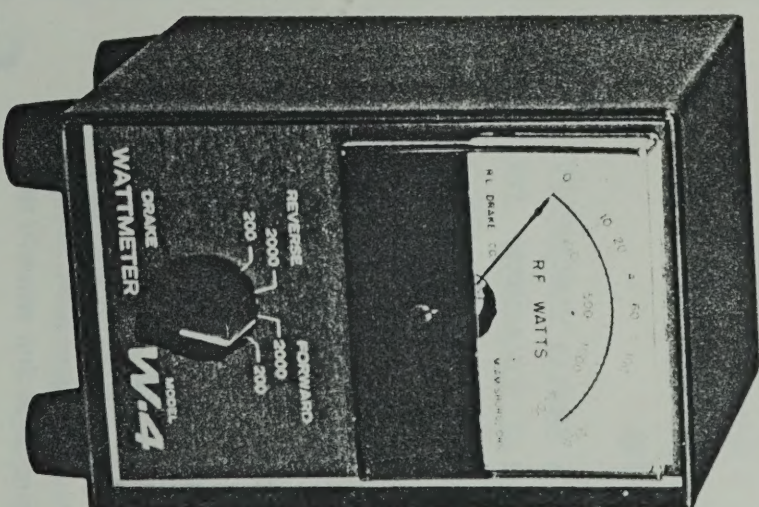




INSTRUCTION MANUAL



MODEL W-4 RF Wattmeter



R. L. DRAKE COMPANY Miamisburg, Ohio U. S. A.



LIMITED WARRANTY

R. L. DRAKE COMPANY warrants each new product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use, and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgment that it is thus defective. Should a malfunction be suspected, write in detail to our Service Department for suggestions concerning the operation, repair or return of your unit if it should prove necessary.

This warranty does not extend to any of our products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside our factory, nor in cases where the serial number thereof has been removed, defaced or changed, nor to units used with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

The R. L. DRAKE COMPANY reserves the right to make any improvements to its products which it may deem desirable without obligating itself to install such improvement in its previously manufactured products.



PRINTED IN U. S. A.



GENERAL

DESCRIPTION. The DRAKE Model W-4 Wattmeter is a through line wattmeter which accurately measures forward and reverse power. The RF coupler is made removable so that it may be conveniently located at the output of the transmitter.

SPECIFICATIONS

FREQUENCY COVERAGE. 1.8 - 54 MHz.

LINE IMPEDANCE. 50 Ohms resistance.

ACCURACY. Wattmeter accuracy is $\pm$ (5% of reading + 2 Watts) on 200 Watts scale, and $\pm$ (5% of reading + 20 Watts) on 2000 Watt scale throughout the range of 1.8 - 54 MHz.

VSWR INSERTION. Insertion of wattmeter in line changes VSWR no more than 1.05:1.

POWER CAPABILITY. 2000 Watts RF continuous duty.

CONTROLS AND JACKS

FRONT PANEL. Range Selector Switch.

REMOVABLE COUPLER. Two input and output connectors (SO 239). Four range calibration potentiometers. One .5 to 5 pF piston trimmer null adjustment.

DIMENSIONS

MAIN CABINET. 6" high, 3-11/16" wide, 4" cabinet depth, 5" overall length.

REMOVABLE COUPLER. 2-1/2" high, 3-3/8" wide, 2-3/4" deep.

MARCH 1976

INSTALLATION

UNPACKING.

Carefully remove the unit from the shipping carton, and examine it for evidence of damage. If any damage is discovered, immediately notify the transportation company that delivered the unit. Be sure to keep the shipping carton and packing material, as the transportation company will want to examine them if there is a damage claim. Keep the carton and packing material even if no shipping damage occurs. Having the original carton available makes packing the unit much easier should it ever be necessary to store it or return it to the factory for service.

NOTE

Fill out the enclosed registration card and return it to the factory immediately to insure registration and validation of the warranty.

The W-4 Wattmeter should be installed between the output of the transmitter (or amplifier) and the antenna. Ordinary PL-259 coax connectors will couple correctly with the SO 239 receptacles on the sensing element. The sensing element is completely removable for station convenience. It can be removed by unscrewing the four machine screws on the bottom of the cabinet that hold it in place. In this manner the sensing element can be installed behind the operating table so that bulky coax need not be brought up. Approximately 3 feet of cable connects the sensing element to the meter allowing a wide range of installation positions.

OPERATION

VSWR MEASUREMENTS. VSWR measurements may be made easily using the nomograph supplied with the W-4 Wattmeter. The nomograph may be stored conveniently in the gap between the main chassis and the outer case of the Wattmeter.

POWER MEASUREMENTS. In order to make full use of the W-4 it should be explained just what is being indicated on the meter. There are 3 different types of power to be considered; forward, reflected, and radiated. In the "forward" position, the W-4 is reading the *sum* of the radiated and reflected power, while in the "reverse" position, it is reading reflected power. This would stand to reason if you would imagine a "bundle" of power going "forward", some of it would be "radiated" and some of it will be reflected back, thus going in the "reverse" direction. Radiated power can thus be found by subtracting the "reverse" power reading from the "forward" power reading.

MAINTENANCE

SERVICE. The W-4 was designed to keep maintenance to a minimum. Since the W-4 is basically a passive device and does not use any tubes, it should provide years of service with proper care. If any problems arise that cannot be solved easily, we suggest that you either return your unit to your dealer, or write directly to R. L. Drake Service Department describing your problem in detail. Include full information concerning external connections, control settings, type of antenna used, etc. Do not return equipment to the factory without proper authorization. Address your request for authorization to:

R. L. Drake Company
540 Richard Street
Miamisburg, Ohio 45342
ATTN: Customer Service Department
Telephone: (Area Code 513) 866-3211
Code-A-Phone Service after
1630 Hours E.S.T.
Telex No. 288-017

DIODE REPLACEMENT. Should either or both of the 1N295 diode rectifiers malfunction, they should be replaced only with the same type. Diodes with different characteristics may seriously impair the accuracy of the Wattmeter.

ALIGNMENT PROCEDURE.

NOTE

The internal coupler adjustments were preset at the factory. Since these controls set the accuracy and null points their adjustment is quite critical. No attempt should be made to disturb the settings unless precision laboratory equipment is available.

The following equipment is necessary for alignment:

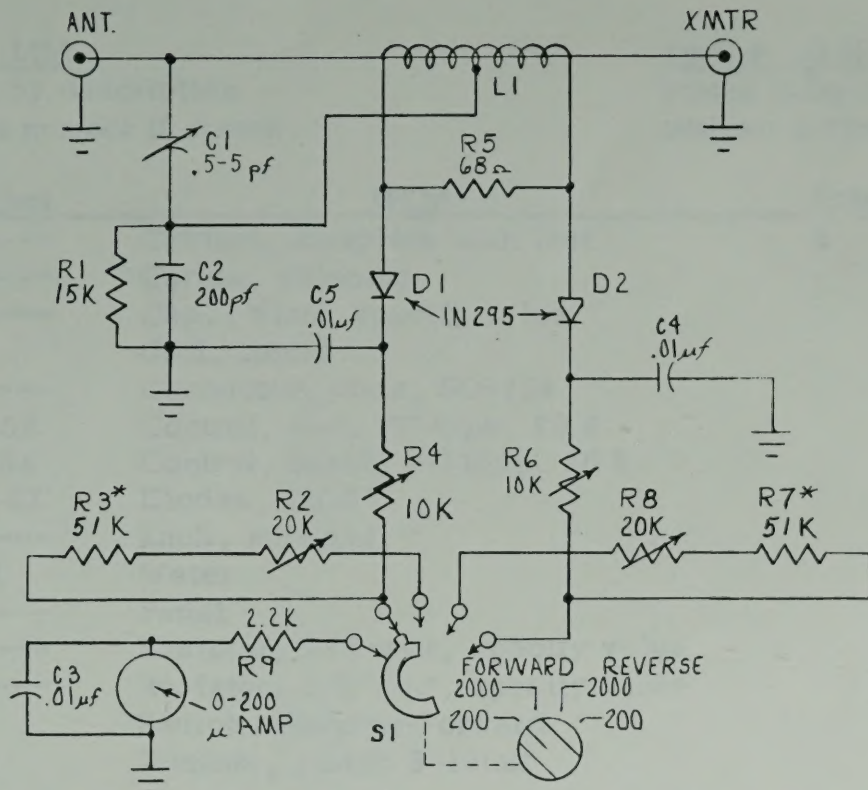
- A 50 Ohm dummy load with an SWR of no more than 1.05:1 at 14 MHz capable of handling 1 kW.
- An accurate RF voltmeter such as the HP410B or Boonton 91CA.
- A transmitter with variable output to 1 kW at 14.00 MHz. All adjustments are made at 14.00 MHz.
- A short piece (3 inches) of 50 Ohm coax such as RG/8U or double male PLR59 connector.
- One insulated alignment tool.

Remove the coupler from the Wattmeter and carefully remove the screws and cover from the coupler exposing the printed circuit board.

NULL ADJUSTMENT. With the transmitter and dummy load connected to the respective jacks on the coupler, and W-4 range switch in the 200 Watt REVERSE position, apply 200 Watts minimum to the load. If any reflected power is visible, using the insulated alignment tool inserted through the hole in the side of the coupler, adjust the piston trimmer for minimum reflected power. If the load is purely resistive this will be essentially zero. This correctly adjusts the 50 Ohm reference level and no further adjustment of the piston trimmer will be required.

FORWARD POWER ADJUSTMENT. Remove the power from the load, switch the W-4 range switch to 200 Watts FORWARD. With the RF voltmeter connected across the dummy load, apply power until voltage across the load is exactly 70.7 Volts RMS. Adjust the calibration pot connected to the brown wire until the W-4 indicates exactly 100 Watts. The 200 Watts FORWARD position of the W-4 is now calibrated and care should be taken not to disturb its potentiometer setting. Switch the W-4 range switch to the 2000 Watts FORWARD position. Increase the power until the voltage across the dummy load is exactly 224 Volts RMS. Adjust the calibration pot connected to the green wire until the W-4 indicates exactly 1000 Watts. Remove the power from the load. The 2000 Watts FORWARD range is now correctly adjusted and care should be taken not to disturb the setting.

REVERSE POWER ADJUSTMENT. Reverse connections to the 2 coax connectors on the coupler. Remove power from the load and turn the Range Switch on the W-4 to 200 Watts REVERSE. With the RF voltmeter connected across the dummy load, apply power until the voltage across the load is exactly 70.7 Volts RMS. Adjust the calibration pot connected to the red wire until the W-4 indicates 100 Watts. Turn the Range Switch on the W-4 to 2000 Watts REVERSE. Increase power until the voltage across the load is exactly 224 Volts RMS. Adjust the calibration pot connected to the white wire until the W-4 indicates 1000 Watts. Remove power from the coupler. Replace the cover carefully.



* SELECTED, IN PRODUCTION

DRAKE AMATEUR PRODUCTS

R-4C

Receiver, covers the 160 meter through 10 meter amateur bands and up to fifteen additional 500 kHz ranges. It has 8-pole crystal filter selectivity with passband tuning and transceives with the T-4XC with excellent sensitivity.

T-4XC

Transmitter, covers the 160 through 10 meter amateur bands and most other frequencies between 1.5 and 30 MHz. It has 8-pole crystal filters for sideband selection. It may be used to transceive with the R-4C.

TR-4C

Transceiver, 300 Watt high frequency single-sideband unit covers the 80 meter through 10 meter amateur bands. Includes AM and CW modes, a linear, permeability-tuned VFO and two 8-pole crystal lattice filters.

L-4B

Linear Amplifier, built for continuous duty at full capacity, 2000 Watts PEP on SSB, 1000 Watts on AM, CW and RTTY. Covers the 80 meter through 10 meter bands.

C-4

Station Console, matches Drake's T-4XC, R-4C and TR-4C.

MN-4

Antenna Matching Network, matches 50 Ohm transmitter output to coax antenna feedline with VSWR up to 5:1. An integral Wattmeter reads forward power in Watts and VSWR directly, 200 Watts continuous duty output.

MN-2000

Antenna Matching Network. Same as MN-4 except: 1000 Watts continuous duty output (2000 Watts PEP) and 3 antenna connectors switch-selectable from front panel.

W-4

Wattmeter, reads forward and reflected power directly in Watts (VSWR from nomograph). Range: 200 and 2000 Watts full scale, 1.8 to 54 MHz.

WV-4

Wattmeter, reads forward and reflected power directly in Watts (VSWR from nomograph). Range: 100 and 1000 Watts full scale, 20 to 200 MHz.

TR-22C

Transceiver, 2 meter VHF-FM, portable. Twelve channels, self-contained batteries and attached microphone.

RCS-4

Remote Coax Switch, provides remote selection of up to five antennas, using only one main feedline. Allows grounding of unused antennas. Motor driven switches controlled from station located console.

SSR-1

General Coverage Receiver, 0.5-30 MHz continuous. All solid state.

For information on any of our products, please feel free to write our Sales Department, 540 Richard Street, Miamisburg, Ohio 45342 or call direct, 513-866-2421.

THEORY OF THE EXPERIMENT

The purpose of this experiment is to determine the relationship between the frequency of a periodic signal and the period of the signal. The experiment is performed using a function generator and an oscilloscope. The function generator is set to produce a sine wave of a known frequency. The oscilloscope is used to measure the period of the signal. The period is the time interval between two consecutive peaks of the signal. The frequency is the number of cycles of the signal per unit time. The relationship between frequency and period is given by the equation $f = 1/T$, where f is the frequency and T is the period. The experiment is performed for several different frequencies and the period is measured for each. The results are then plotted on a graph of period versus frequency. The graph shows that the period is inversely proportional to the frequency, which is consistent with the equation $f = 1/T$.

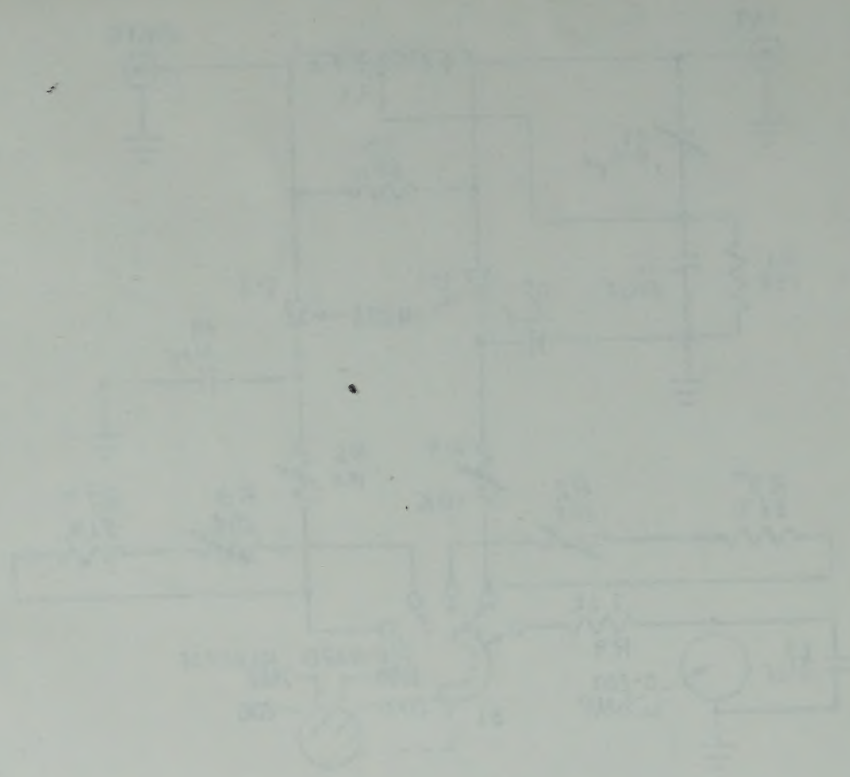
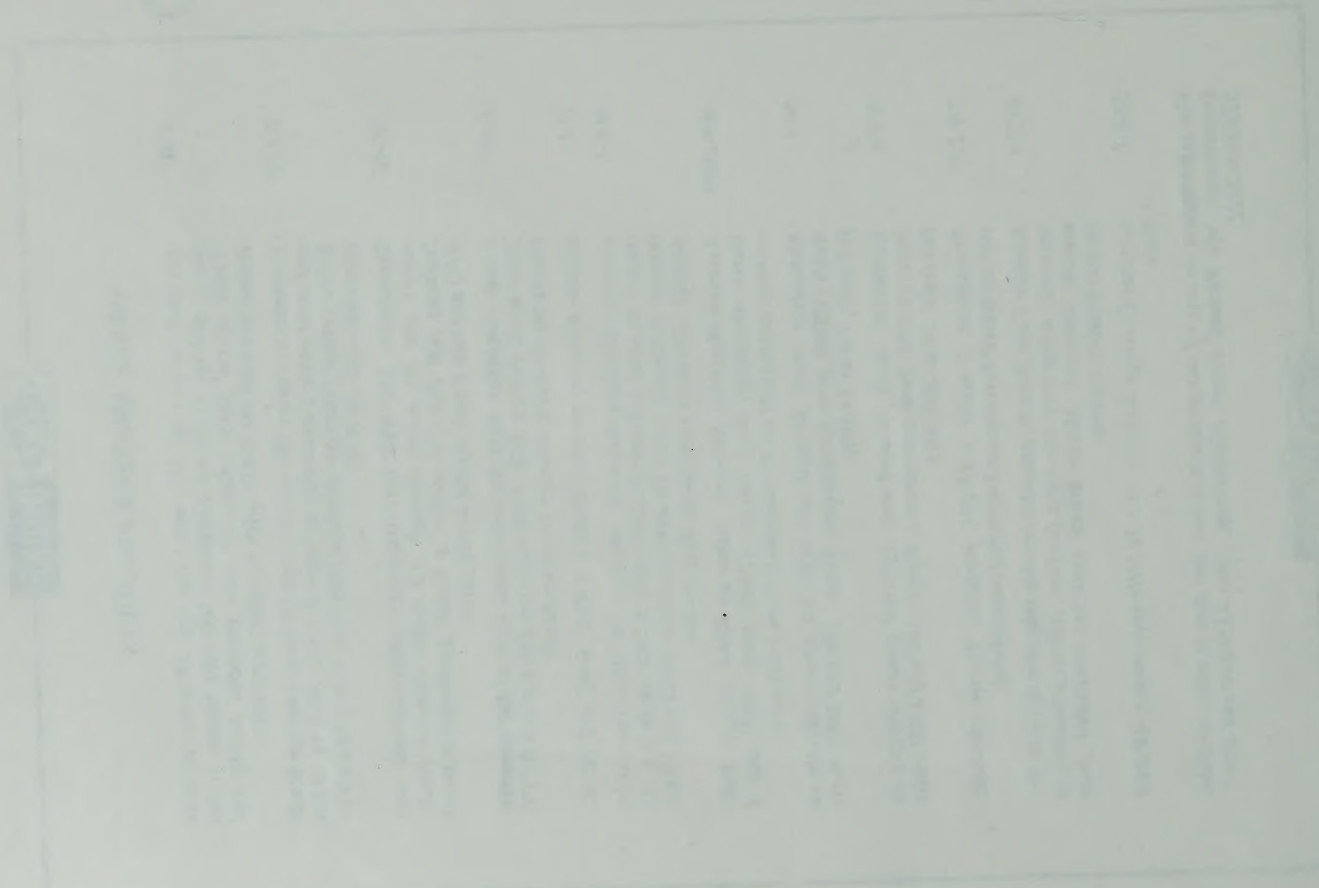


FIGURE 1: CIRCUIT FOR FUNCTION GENERATOR

W-4 SPARE PARTS LIST

April 1, 1976

Note: Order parts by description
include part number if shown.

Prices subject to change
without notice.

Part Number	Symbol	ITEM	PRICE EACH
-----	-----	Cabinet, complete with feet	\$ 5.00
-----	-----	Carton, shipping	.75
-----	-----	Cap., disc, specify value	.10
-----	L-1	Coll, toroid	2.50
-----	-----	Connector, coax, SO-239	.75
326-0140	R-2&8	Control, Red, PC type, 20 K	.40
326-0130	R-4&6	Control, Black, PC type, 10 K	.40
302-0020	D-1&2	Diodes, 1N295	.30
-----	-----	Knob, selector	.45
358-0050	M-1	Meter	18.00
344-0120	-----	Panel	6.00*
-----	-----	Resistor, 1/4 watt, specify value	.10
-----	-----	Resistor, 1/2 watt, specify value	.10
366-0330	S-1	Switch, Reverse-Forward	2.55
320-5290	C-1	Trimmer, piston 3-10uuf	.40

WV-4 SPARE PARTS LIST

Part Number	Symbol	ITEM	PRICE EACH
-----	-----	Cabinet, complete with feet	\$ 5.00
-----	-----	Carton, shipping	.75
-----	-----	Cap., disc, specify value	.10
-----	L-1	Coll, toroid	2.50
-----	-----	Connector, coax, "N" type	1.50
326-0140	R-2,4,6,8	Control, Red, PC type, 20 K	.40
302-0180	D-1&2	Diodes, MED-701/H.P. 5082-2800	3.00
-----	-----	Knob, selector	.45
358-0060	M-1	Meter	18.00
344-0130	-----	Panel	6.00*
-----	-----	Resistor, 1/4 watt, specify value	.10
-----	-----	Resistor, 1/2 watt, specify value	.10
366-0330	S-1	Switch, Reverse-Forward	2.55
320-5250	C-1	Trimmer, piston .5-5 uuf	.40

*Price plus return of old part.

Postage will apply to all parts orders. ALL PARTS ORDERS NOT EXCEEDING \$15.00 WILL BE SUBJECT TO A \$1.00 HANDLING CHARGE.

April 1, 1972
 Price subject to change
 without notice

NY-4 BROWN BERRY LITE
 Price subject to change
 without notice

ITEM	PRICE EACH
100-0100	1.00
100-0101	1.00
100-0102	1.00
100-0103	1.00
100-0104	1.00
100-0105	1.00
100-0106	1.00
100-0107	1.00
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100-0195	1.00
100-0196	1.00
100-0197	1.00
100-0198	1.00
100-0199	1.00
100-0200	1.00

NY-4 BROWN BERRY LITE

ITEM	PRICE EACH
100-0201	1.00
100-0202	1.00
100-0203	1.00
100-0204	1.00
100-0205	1.00
100-0206	1.00
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100-0293	1.00
100-0294	1.00
100-0295	1.00
100-0296	1.00
100-0297	1.00
100-0298	1.00
100-0299	1.00
100-0300	1.00

* Price may vary of old stock

Prices will apply to all parts orders. All parts orders not exceeding \$17.00 will be shipped to a 1/2% handling charge.